LINEAR DRIVER
USER MANUAL
ALL MODELS

Manual No 238003 Rev.08.00.A

AYLESBURY AUTOMATION

LINEAR DRIVER

INTRODUCTION

Please read this manual carefully before using your linear Driver. This manual contains information that will assist you with all aspects of safe unpacking, installation and maintenance, to ensure machine longevity.

This manual illustrates all options that are available in the Linear Driver range, i.e. Models L5M, Euro L1, and L10; not all of these options will be on your machine.

Under no circumstances should any factory setting within this machine be altered without the written agreement of Aylesbury Automation or unless otherwise specified as part of a documented procedure.

WARNING

'Umax' dial on all control boxes has been factory set to maximum coil voltage for multi-voltage coils. Any adjustment of this setting could result in damage to the coil and control box due to overheating.

Aylesbury Automation makes every effort to ensure that this manual is reviewed whenever any significant changes are made to the design. However our policy of continuous product improvement may result in some small differences between the unit supplied and the description in this document.

Risk assessments for these products are available on request.

For general enquiries regarding your machine, contact the **Service Department** on:

Tel. +44 (0) 1296 314300
Fax. +44 (0) 1296 421625

For spare parts enquiries, contact the **Automation Sales Department** on:

Tel. +44 (0) 1296 314300
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1.0 INSTALLATION

1.1 Services

The following services are required before the machine can be installed:

200v 50/60Hz. Single Phase or 100v 50/60Hz. Single Phase

1.2 Unpacking and Handling

Before attempting to unpack and move the linear driver, refer to 'Technical Specification', to ascertain the weight to ensure a safe lifting operation. Carefully remove all the transit packaging from the machine. Inspect all the materials supplied for any signs of transit damage. Report any defects to Aylesbury Automation.

NOTE: The user is recommended to retain the packaging. If any damage has occurred to the equipment, Aylesbury Automation will need to inspect all materials.

WARNING

Do not lift the linear driver by the top plate or the tracking (if fitted), as this WILL strain the springs and alter the coil setting.

MODEL No.	HANDLING	WEIGHT (UNTOOLED UNIT)
L5M	Lift carefully into its operating position.	8.0 Kg.
Euro L1	Remove the spare springs, shims and counterbalance weights (untooled units only), then move the linear driver carefully into its operating position	13.0 Kg.
L10	Lift carefully into its operating position	28.0 Kg.

1.3 Setting-up Procedure

CAUTION: Do not connect the linear driver directly to the mains supply.

Connect the electrical supply to the control box (see control box instructions). Plug the linear driver into the control box. Turn the control box on. Rotate the control knob until the feed rate is satisfactory, but no further than necessary, as excessive vibration may actually decrease output and cause unnecessary wear and waste of power.

SAFETY WARNING

Do not attempt to start the machine unless you understand what you are doing and you have taken all the safety precautions normally required for industrial electronic control systems and machines. Thoroughly read all manuals for unfamiliar equipment being used in conjunction with this machine.

NOTE: This machine is to be used only with the product for which it was supplied.

It is recommended that the linear driver should be mounted on a stand (where necessary), which must be of a stable and rigid construction to prevent the transmission of vibration produced by the linear driver, this particularly applies to the L5M.

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The linear driver is equipped with either a base plate or mounting holes (see Fig.1), which allow the linear driver to be secured to a suitable work surface. If there is no base plate supplied with the machine, the linear driver must be secured using the threaded holes on the underside of the mounting feet.

	MOUNTING HOLE DETAILS	
MODEL	**TYPE AND SIZE**	**QUANTITY**
L5M	Plain Ø6.5	4
Euro L1	Slots 6.5mm wide x 8mm long	4
L10	Ø9mm Counterbored Ø15mm x 8mm deep	4

Fig.1 Linear driver mounting options

The three-core cable from the linear driver coil and the mains supply should be connected to an appropriate control box. See separate control box manual for wiring instructions etc.

Aylesbury Automation controllers are available for 200 and 100 volts, 50 and 60 Hz. A.C. mains supply. Note: Model L5M and L10 linear drivers are available in half wave form (hard vibration) only. Model Euro L1 linear drivers are available in both half and full wave (soft vibration) form.

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2.0 TUNING THE UNIT

2.1 Tuning Procedure

SAFETY WARNING

At no time should hands or tools be placed within the linear track or any fitted tooling, nor attempts be made to clear blockages whilst the machine is operating. Linear drivers vibrate at high frequency and contact with any of the moving surfaces could cause abrasions. ISOLATE POWER SUPPLY

Although the linear drivers are tuned during manufacture, after a track has been fitted it may be necessary to re-tune your unit. Correct tuning of the linear driver is essential to ensure that the optimum performance is achieved. To tune the linear driver, follow the procedure below:

Note: For model L10, the following procedure applies to **both** front and rear spring stacks.

PROCEDURE	TICK WHEN CHECKED
Check that the control device has been connected correctly (see '3.1 Setting-Up Procedure').	
Remove the cover screws and then the cover (Euro L1 only). Tighten all spring stack bolts to the correct setting (see '5.0 Torque Settings').	
Check the air gap between the armature and the coil. If necessary adjust the gap to the correct dimension (see '3.1 Adjustment of the Coil to Armature Clearance').	

With the controller running, slowly loosen the bottom socket capscrew on the **front** spring stack. This will produce a change in the speed of the components being conveyed along the linear track.

If the feed rate decreases, the unit is **undersprung** – add one spring to the rear spring stack and re-assemble. Tighten socket capscrews and run unit. If the linear driver slows down, repeat above step for front spring stack.	
If the feed rate increases, the unit is **oversprung** - remove one spring from the front spring stack and re-assemble. Tighten socket capscrews and run unit. If the linear driver speeds up, repeat above step for rear spring stack.	

If the linear track has ‘dead’ spots, or the components run backward, then:

Add reaction mass to the rear of the unit. (Euro L1 and L10 only).	
Check front and rear overhang, and length, of track (see ‘7.0 Guidelines for Adding Linear Tracks’).	

2.2 Recommended Parts for Tuning

If, as a result of following the above procedures, it is found that additional springs or reaction masses are required, order part numbers listed below:

	Springs and Shims		Reaction Mass	
Model No.	Description	Part No.	Description	Part No.
L5M	3 Ply fibreglass	A337038	N/A	N/A
	5 Ply fibreglass	A337034		
	7 Ply fibreglass	A337039		
Euro L1	1.0mm Thick	A290235	1.0 Kg. 1.6 Kg.	A268027 A268028
	1.5mm Thick	A290234		
	Shim (2 per spring)	A290240		
L10	2.4mm (3/32”) Thick	A253015	1.0 Kg.	A334023
	3.2mm (1/8”) Thick	A253016		
	4.8mm (3/16”) Thick	A253017		
	Shim (2 per spring)	A200566		

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3.0 COIL

3.1 Adjustment of Coil to Armature Clearance

SAFETY WARNING

The electrical power used in this equipment is at mains potential. Before carrying out maintenance or repair, isolate the electrical supply. If it is not feasible to isolate the power supply when carrying out functional testing or adjustments, any such maintenance must only be undertaken by technicians who are fully aware of the dangers involved and who have taken adequate safety precautions.

If the gap is too small, the coil will strike the armature block. Conversely, if the gap is too great when the controller is turned to the maximum output, the feeder will not produce sufficient power to move the part at the desired rate. It also results in the heating of the coil and wasted energy.

To adjust the coil to the armature clearance, follow the procedure below for your machine:

MODEL	PROCEDURE	NOTE
L5M	1. With the power on, turn the control box dial to 50% 2. Slacken 4 off M5 x 10 socket capscrews (2 each side) retaining the side plates. 3. Tap either side plate, with a soft-headed hammer, until coil and armature begin to resonate. 4. Tap either side plate, with a soft-headed hammer, until coil and armature cease to resonate. 5. Tighten 4 off M5 x 10 socket capscrews (2 each side) retaining the side plates. 6. Unit is now ready for operation.	Slacken and tighten 2 off M5 x 10 socket capscrews in **slotted** holes only
Euro L1	1. Isolate power supply 2. Remove side covers 3. Check air gap between coil and armature. Correct air gap is 1.0mm for both full and half wave coils. 4. Slacken 2 off M6 x 30 socket capscrew retaining armature 5. Place 1.0mm thick spacer at each end of the armature between the armature and the coil. 6. Tighten 2 off M6 x 30 socket capscrew retaining armature 7. Refit side covers 8. Switch power supply on 9. Unit is now ready for operation	
L10	1. Isolate power supply 2. Check air gap between coil and armature. Correct air gap should be 2.0mm. 3. Slacken 2 off M6 x 50 socket capscrews retaining armature 4. Place 2.0mm thick spacer at each end of the armature between the armature and the coil. 5. Tighten 2 off M6 x 50 socket capscrews retaining armature 6. Switch power supply on 7. Unit is now ready for operation	

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3.2 Replacing Voltage Plug

The coil fitted to your Euro L1 and L10 linear driver is an epoxy-encapsulated multi-voltage unit and can be adapted to different voltages and/or frequencies by following the procedure below:

MODEL	PROCEDURE	NOTE
Euro L1 and L10	1. Isolate power supply 2. Locate the existing voltage plug. This can be found on the underside of coil. 3. Remove 2 off M6 x 50 socket capscrews retaining coil (L10 only). 4. Pull coil clear of linear driver (L10 only). 5. Remove 2 off M2.5 x 6 cross head screws retaining the voltage plug 6. Remove voltage plug. It may be possible that some resistance is met when attempting to remove the voltage plug. In this event, use a suitable tool to grip the plug, but not with bare jaws or using excessive force, as damage **will** occur to the plug. 7. Insert the replacement voltage plug (see Table 1 for range available) ensuring that the screw holes in the plug are in line with the holes in the plug housing. If the plug does not push home with only light pressure, **DO NOT FORCE IT ANY FURTHER**. The plug can only be inserted in one orientation. Turn plug round and reinsert. 8. Reinsert 2 off M2.5 x 6 cross-head screws. Do not use excessive force when tightening these screws, as this will strip the thread of the voltage plug housing. 9. Re-fit coil and 2 off M6 x 50 socket capscrews. Tighten socket capscrews (L10 only). 10. Set coil to armature air gap (see '3.1 Adjustment of Coil to Armature Clearance') – L10 only. 11. Switch power supply on 12. Unit is now ready for operation	 **Always isolate power supply before attempting to replace any voltage plugs**

Part Number	Voltage	Frequency
A803173	200v	100 Hz (full wave)
A803174	200v	50 Hz (half wave)
A803175	100v	100 Hz (full wave)
A803176	100v	50 Hz (half wave)

Table 1

3.3 Replacing Complete Coil

NOTE: **It is strongly recommended that an Aylesbury Automation service engineer carry out coil replacement. Should customers wish to effect this work themselves the instructions in this section should be strictly adhered to.**

SAFETY WARNING **Before carrying out coil replacement, ISOLATE POWER SUPPLY.**

MODEL	PROCEDURE
L5M	1. Isolate power supply 2. Disconnect plug from control box. Remove plug from cable 3. Remove cable clamp 4. Remove 2 off **lower** M5 x 10 socket capscrews retaining left hand side plate to base machining 5. Remove 2 off **upper** M5 x 10 socket capscrews retaining coil to right hand side plate 6. Pull side plate and coil clear of unit 7. Pull cable through recess in top plate 8. Remove 2 off M5 x 10 socket capscrews retaining coil to side plate 9. Remove coil 10. To replace coil, repeat steps 2-8 in reverse order 11. Set coil to armature air gap (see '3.1 Adjustment of Coil to Armature Clearance'). 12. Switch power supply on 13. Unit is now ready for operation
Euro L1	1. Isolate power supply 2. Remove side covers 3. Disconnect plug from control box. Remove plug from cable 4. Slacken off 2 off M6 x 10 socket countersunk screws retaining cable clamp 5. Remove 2 off M6 x 45 socket capscrews, including associated nuts and washers, retaining coil to base machining 6. Pull cable through cable clamp 7. Remove coil 8. To replace coil, repeat steps 3-6 in reverse order 9. Set coil to armature air gap (see '3.1 Adjustment of Coil to Armature Clearance'). 10. Refit side covers 11. Switch power supply on 12. Unit is now ready for operation
L10	1. Isolate power supply 2. Disconnect plug from control box. Remove plug from cable 3. Remove cable clamp 4. Remove 2 off M6 x 50 socket capscrews retaining coil to base machining 5. Remove coil 6. To replace coil, repeat steps 2-4 in reverse order 7. Set coil to armature air gap (see '3.1 Adjustment of Coil to Armature Clearance'). 8. Switch power supply on 9. Unit is now ready for operation

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4.0 SPRING REPLACEMENT

The springs have standard dimensions and require no adjustment after making a replacement.

MODEL	PROCEDURE
L5M	1. Isolate power supply 2. Having identified the spring bank that houses the broken spring (see '2.1 Tuning Procedure' and '8.0 TROUBLESHOOTING') remove 2 off M6x 20 hex. head screws retaining the identified spring bank, making note of the position and thickness of the springs being removed 3. Replace broken spring/springs and re-assemble spring bank, ensuring that a shim separates each end of the spring 4. Refit spring bank and ensure top plate is level 5. Release and re-tighten all other spring fixings. Tighten each socket capscrew gradually to reduce the strain imparted to the springs (see '5.0 Torque settings'). 6. Set coil to armature clearance (see '3.1 Adjustment of Coil to Armature Clearance'). 7. Switch power supply on 8. Unit is now ready for operation
Euro L1	1. Isolate power supply 2. Remove cover plates 3. Having identified the spring bank that houses the broken spring (see '2.1 Tuning Procedure' and '8.0 TROUBLESHOOTING') remove 2 off M8x 30 socket capscrews retaining the identified spring bank, making note of the position and thickness of the springs being removed 4. Replace broken spring/springs and re-assemble spring bank, ensuring that a shim separates each end of the spring 5. Refit spring bank, inserting a 2.0mm thick spacer above and below the spring bank to ensure sufficient operating clearance between the base and top plate 6. Release and re-tighten all other spring fixings. Tighten each socket capscrew gradually to reduce the strain imparted to the springs (see '5.0 Torque settings'). 7. Set coil to armature clearance (see '3.1 Adjustment of Coil to Armature Clearance'). 8. Switch power supply on 9. Unit is now ready for operation
L10	1. Isolate power supply 2. Having identified the spring bank that houses the broken spring (see '2.1 Tuning Procedure' and '8.0 TROUBLESHOOTING') remove socket capscrews retaining the identified spring bank, making note of the position and thickness of the springs being removed 3. Replace broken spring/springs and reassemble spring bank 4. Refit spring bank and ensure top plate is level 5. Release and re-tighten all other spring fixings. Tighten each socket capscrew gradually to reduce the strain imparted to the springs (see '5.0 Torque settings'). 6. Set coil to armature air gap (see '3.1 Adjustment of Coil to Armature Clearance). 7. Switch power supply on 8. Unit is now ready for operation

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5.0 TORQUE SETTINGS

The table below lists the torque settings for all socket capscrews requiring tightening when normal service procedures are carried out. **Under no circumstances must the settings listed be exceeded.**

MODEL NO.	TOP PLATE		BOTTOM PLATE	
	lbf.ft	Nm.	lbf.ft	Nm.
L5M	14	19	14	19
EURO L1	14	19	14	19
L10	14	19	14	19

TO ENSURE THAT THE UNIT OPERATES AT ITS OPTIMUM EFFICIENCY, AND TO PREVENT ANY DAMAGE TO THE UNIT DUE TO EXCESSIVE TORQUE, THE ABOVE SETTINGS SHOULD BE ADHERED TO USING A TORQUE WRENCH.

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6.0 MAINTENANCE

WARNING

By virtue of design, the linear driver will produce vibratory residue from the products being fed. It is the responsibility of the operating company to ensure that all relevant safety precautions are taken to handle any hazardous material at all times during operation, cleaning and maintenance.

Daily

1. Wipe the linear driver track clean, taking care to avoid the possibility of personal injury from any sharp edges or projections.
2. Check the performance and look for dead spots as an indication of any broken springs, see ‘8.0 TROUBLESHOOTING'; or ‘3.1 Adjustment of Coil to Armature Clearance’.
3. Inspect and clean any air jets, where applicable.

Weekly

1. **SAFETY CHECKS.** Check that any safety or emergency devices where fitted are fully functional.
2. Inspect the linear driver and any fitted tooling for any wear and replace where necessary.

3 Monthly

1. Check the torque of all spring bolts, See '5.0 TORQUE SETTINGS'.
2. Check the tightness of all the rubber feet and tighten if required.

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7.0 GUIDELINES FOR ADDING LINEAR TRACKS (IF NOT FACTORY FITTED)

If you wish to add orientation tooling to an untooled bowl, please read the following guidelines:

1. All tracks fitted to the linear driver should be of a light but rigid construction.
2. The track must be securely fixed to the linear driver to achieve the maximum performance.
3. Track lengths and maximum overhangs must be adhered to (see table 2).
4. **ALWAYS** maintain a gap of approximately 1.5mm between the track ends and any other equipment, contact between these when the linear driver is running **MUST** be avoided.
5. For a summary of recommended track mechanical properties refer to table 2. Note: Maximum track weight quoted **includes** components.

MODEL	RECOMMENDATIONS	NOTES
L5M	Maximum track weight – 1.5 Kg. Maximum track length – 350mm Maximum overhang (inlet) – Equal to rear Maximum overhang (outlet) – Equal to front	
Euro L1	Maximum track weight – 7 Kg. Maximum track length – 800mm Maximum overhang (inlet) – 150mm Maximum overhang (outlet) – 330mm	Inlet overhang needs to be 20% less than outlet overhang.
L10	Maximum track weight – 20 Kg Maximum track length – 1000mm Maximum overhang (inlet) – See notes Maximum overhang (outlet) – 450mm	Inlet overhang should not exceed the distance the reaction masses protrude from the base.

Table 2

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8.0 TROUBLESHOOTING

Below is a guide to help solve some of the problems that might occur during the life of the machine.
If after following all the instructions carefully you still have a problem, then do not hesitate to telephone our Service Department for assistance.

SAFETY WARNING Before any maintenance is carried out **ISOLATE POWER SUPPLY**

Symptom	Possible Cause/Remedy	Tick When Checked
Linear driver not running	Check electrical supply to control box	
	Check connections from control box to linear driver	
	Check voltage plug in base of coil is present and correctly fitted.	
	Fuse in control box failed - change fuse.	
Coil becomes hot	Incorrect voltage plug fitted into coil - Check which voltage plug is fitted, replace as required (Euro L1 and L10 only).	
	Coil faulty – replace (see '3.3 Replacing complete coil').	
After a period of time the system is not giving the required output.	Spring bank screws loose - tighten to the correct value (see '5.0 TORQUE SETTINGS').	
	Coil gap is incorrect – adjust (see '3.1 Adjustment of Coil to Armature Clearance').	
	Springs broken – replace (see '4.0 Spring Replacement').	
	Rubber foot is loose – tighten.	
Linear driver develops loud noise.	Metal covers loose (Euro L1 only) - tighten screws.	
	Foreign bodies in coil gap - clean then check the gap, adjust if necessary (see '3.1 Adjustment of Coil to Armature Clearance').	
	Coil gap is incorrect – adjust (see '3.1 Adjustment of Coil to Armature Clearance').	
Linear driver characteristics change.	Check tuning – Rectify as necessary (see '2.1 Tuning Procedure').	
	Track mountings loose – Empty track and tighten mountings.	
	Control box setting altered – Check setting and rectify as required.	
Erratic feeding and dead spots.	Track mountings loose – Empty track and tighten mountings.	
	Springs broken – replace (see '4.0 Spring Replacement').	
	Reaction mass not suitable for track fitted (applies only when track is altered) or loose. Tighten socket capscrews retaining reaction mass or add/subtract reaction mass as required (Euro L1 and L10 only).	

9.0 RECOMMENDED SPARES

It is essential for the continuing safe and efficient operation of your machine that only genuine replacement parts are used. These are made to original drawings and manufacturing tolerances and are, therefore, completely interchangeable with the originals.

Orders or enquiries about machine parts should be directed to the Sales Department, quoting the machine reference number (clearly stamped on the machine identification plate), and the part number. In this way reference can be immediately made to the details and drawings of the machine.

Spares of certain items should be kept in stock by the customer to ensure immediate availability, this particularly applies to those items which are susceptible to wear or abuse, these are marked with # on the parts list pages.

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10.0 DECOMMISSIONING

WARNING:

By virtue of design, any dynamic parts movement system may produce component contact residue from the products being fed. It is the responsibility of the operating company to ensure that all relevant safety precautions are taken should any hazardous materials be present during cleaning and maintenance.

To decommission the conveyor at the end of a run, follow the procedure below:

1. Run the linear driver until it is clear of components.
2. Clean the linear driver thoroughly.
3. Disconnect the main power supply unit.
4. Lightly oil all non-painted surfaces

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PARTS LIST AND ASSEMBLY DRAWINGS

		DRIVE UNIT MODEL NUMBER		
Item No.	Description	L5M	Euro L1	L10
1	Linear Base Machined	A333110	A268029	A334045
2	Linear Top Machined	A333115	A268025	A334047
3	Base Plate			A334043
4	Cover, Left Hand		A268026	
5	Cover, Right Hand		A268031	
6	Side Plate, Left Hand	A333133		
7	Side Plate, Right Hand	A333134		
8	Foot Support		A268032	
9	Fixing Plate ℵ		A268033	
10	Locknut		Z57434	
11	Adjusting Nut		Z57435	
12	Reaction Mass – 1.0 kg			A334023
13	Reaction Mass – 1.2 kg		A268027	
14	Reaction Mass – 1.75 kg		A268028	
15	Rubber Foot		A290230	A251009
16	Clamp Plate	A265028	A290233	A200565
17	End Plate		A290232	
18	Shim ℑ #	A337033	A290240	A200566
19	Spring – 1.0mm Thick ℜ #		A290235	
	Spring – 1.5mm Thick ℜ #		A290234	
	Spring – 2.4mm (3/32") Thick ℜ #			A253015
	Spring – 3.2mm (1/8") Thick ℜ #			A253016
	Spring – 4.8mm (3/16") Thick ℜ #			A253017
	Spring – 3 ply ℜ #	A337038		
	Spring – 5 ply ℜ #	A337034		
	Spring – 7 ply ℜ #	A337039		
20	Coil Assembly – Multi-voltage/frequency		A803097	A803098
	Coil Assembly 100v 50 Hz Half Wave	A333130		A803096
	Coil Assembly 200v 50 Hz Half Wave	A333131		A803086
21	Voltage Plug 100v Half Wave #		A803176	A803176
	Voltage Plug 100v Full Wave #		A803175	
	Voltage Plug 200v Half Wave #		A803174	A803174
	Voltage Plug 200v Full Wave #		A803173	
22	Armature	A333132		
23	Cable Clamp	Z59927	A290309	Z59927
24	M5 x 10 Socket Capscrew	A801709	A801709	
25	M5 x 16 Socket Capscrew	A801690		
26	M6 x 10 Socket Capscrew		A801899	
27	M6 x 30 Socket Capscrew		A801684	
28	M6 x 35 Socket Capscrew		A801923	
29	M6 x 45 Socket Capscrew		A801901	
30	M6 x 50 Socket Capscrew			A801695
31	M8 x 25 Socket Capscrew			A801682
32	M8 x 30 Socket Capscrew		A801669	
33	M12 x 80 Socket Capscrew ℘			A801907
34	M5 x 10 Countersunk Socket Screw ℵ		A801000	
35	M6 x 10 Countersunk Socket Screw		A801807	
36	M6 x 20 Hex. Head Screw	A801736		
37	M6 Nyloc Nut			A801944
38	M5 Washer	A801931		
39	M6 Washer	A801747	A290711	A290711

ℵ Optional part

ℑ 2 Shims required per spring

ℜ Quantity of springs depends on the weight of track used e.t.c.

℘ M12 x 80 Socket Capscrew supplied as standard, but length required to change depending on quantity of reaction masses fitted